Exhibit 54

R&D Corner

BruxZir®: Virtually Bulletproof What Is It? Why Does it Work?

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by ***Robin A. Carden***

Zirconia has been a popular dental material for the last several years for many reasons. It is used to create copings for crowns, frameworks for bridges and custom implant abutments for implant cases. Glidewell Laboratories has recently introduced BruxZir® Solid Zirconia, a full-contour zirconia restoration with no porcelain overlay. Made from zirconium oxide powder, this advanced material has been refined to produce the strongest and most reliable all-ceramic to date. This article provides a material science overview of zirconium dioxide (ZrO_2), one of the most studied ceramic materials in the world.

Also known as zirconium oxide or zirconia, it is commercially available in two basic forms: naturally, as the mineral Baddeleyite, and synthetically, as derived from zircon sand ($ZrSiO_4$). Zirconia powder (zirconium oxide, ZrO_2) is synthesized from zircon sand ($ZrO_2 \cdot SiO_2$) using a solid-state reaction process. Several oxides are added to zirconia to stabilize the tetragonal and/or cubic phases: magnesium oxide (MgO), yttrium oxide (Y_2O_3), calcium oxide (CaO) and cerium (III) oxide (CE_2O_3), among others. Zirconia is a unique advanced ceramic, a chemical compound having the formula ZrO_2. BruxZir is manufactured from yttria-stabilized

(A) Inclusive Titanium Abutment and BruxZir crown. (B) One piece screw-retained BruxZir with titanium insert.

The fracture toughness, or K1C value, for partially stabilized zirconia is high because of a unique event called phase transformation toughening.

zirconia (YSZ) powder, which exhibits superior mechanical properties such as high strength and flexibility. A technological breakthrough, YSZ surpasses the strength limitations of traditional fine ceramics. The yttria-stabilized zirconia has potential for use in a wide variety of applications — everything from telecommunications to the new energy of the future to environmentally friendly products.

Partially stabilized zirconia is an ideal material for dental restorations like BruxZir because of the four physical properties it exhibits.

The first is high flexural strength. Typical zirconia materials have a flexural strength of more than 1,200 MPa. However, because of post-powder processing, BruxZir Solid Zirconia dental restorations are able to exceed that strength threshold, with flexural strengths up to 1,465 MPa.

The second is high fracture toughness, or K1C value. For example, a piece of lead or steel has high fracture toughness; glass or brittle materials have a low value. The fracture toughness for partially stabilized zirconia is high because of a unique event known as phase transformation toughening that occurs in the material. The toughening mechanism comes into play when a crack is encountered. The cubic grains are constraining the tetragonal precipitates that want to expand and release associated energy. When these grains are faced with a propagating crack tip, the tetragonal phase is released and allowed to change back to the more stable monoclinic phase. This results in the associated volumetric expansion, effectively closing the advancing crack. A kind of self-healing event occurs. This also means the material has high impact resistance.

The third property is excellent resistance to thermal shock. Zirconia has relatively low thermal expansion numbers, which means it will remain very stable in the mouth.

Unsintered BruxZir Solid Zirconia crowns (intaglio surface)

Unsintered BruxZir Solid Zirconia crowns (occlusal surface)

This patient presented with a failing amalgam restoration.

BruxZir Solid Zirconia crown shown on a natural abutment

Inclusive Custom Titanium Implant Abutment

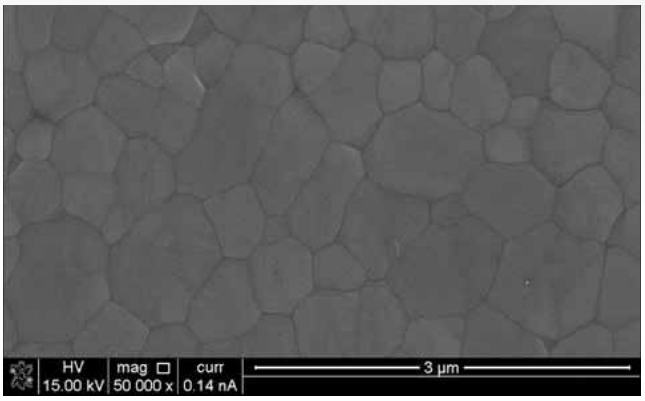
BruxZir Solid Zirconia crown

Screw-retained BruxZir Solid Zirconia crown

Screw access opening sealed

In looking to create the strongest zirconia in the world, we found something else has happened: We created a zirconia with improved translucency.

This Instron machine provides the measurement of a material's mechanical properties, including flexural, fracture and tensile strength.



This SEM machine photo exhibits the crystalline structure of zirconia.

The fourth, and most innovative, is color and translucency. Zirconia has a natural opaque white hue, but Glidewell Laboratories has recorded advancements that allow zirconia to be changed into a more desirable translucent natural ivory shade. This shade is much more lifelike than typical snow-white zirconia. The lab's scientists start with the most pure powders available and create better chemistry by refining particulates via size reduction and blending.

The laboratory then creates a green pre-form with very high pre-bisque firing density by using unique consolidation processes. These processes allow the smallest particulates to be as close as possible before the machining starts. By doing this, the lab also reduces the elongation factor, which means a more accurate crown dimension. After machining, the part is sintered to full density. By using these processes and refining the starting powder, we are able to create a material that has small grain size, which improves flexural strength and fracture toughness. As a crack moves through a material's grain boundaries it is deflected by the material's grains. If a material has many grains to deflect and take energy out of the force of the crack, it becomes inherently stronger. But in looking to create the strongest zirconia in the world, we found something else has happened: We created a zirconia with improved translucency. Focusing on smaller particulates created better translucency. And BruxZir Solid Zirconia has a higher translucency than other dental zirconias.

Getting back to the workings of the material, in the field of mechanical properties, strength and toughness are related as follows. Brittle materials may exhibit significant tensile strength by supporting a static load. Toughness, however, indicates how much energy a material can absorb before mechanical failure. Fracture toughness is a property that describes the ability of a material with inherent microstructural flaws to resist fracture via crack growth and propagation. Methods have been devised to modify the yield strength, ductility and fracture toughness of both crystalline and amorphous materials. Fracture toughness is a quantitative way of expressing a brittle material's resistance to fracture when a crack is present. This is one of the most important properties of any brittle material for virtually all design applications. If a material has a high value of fracture toughness, it will probably undergo ductile fracture. Brittle fracture is very characteristic of most ceramic and glass-ceramic materials, which typically exhibit low and inconsistent fracture toughness.

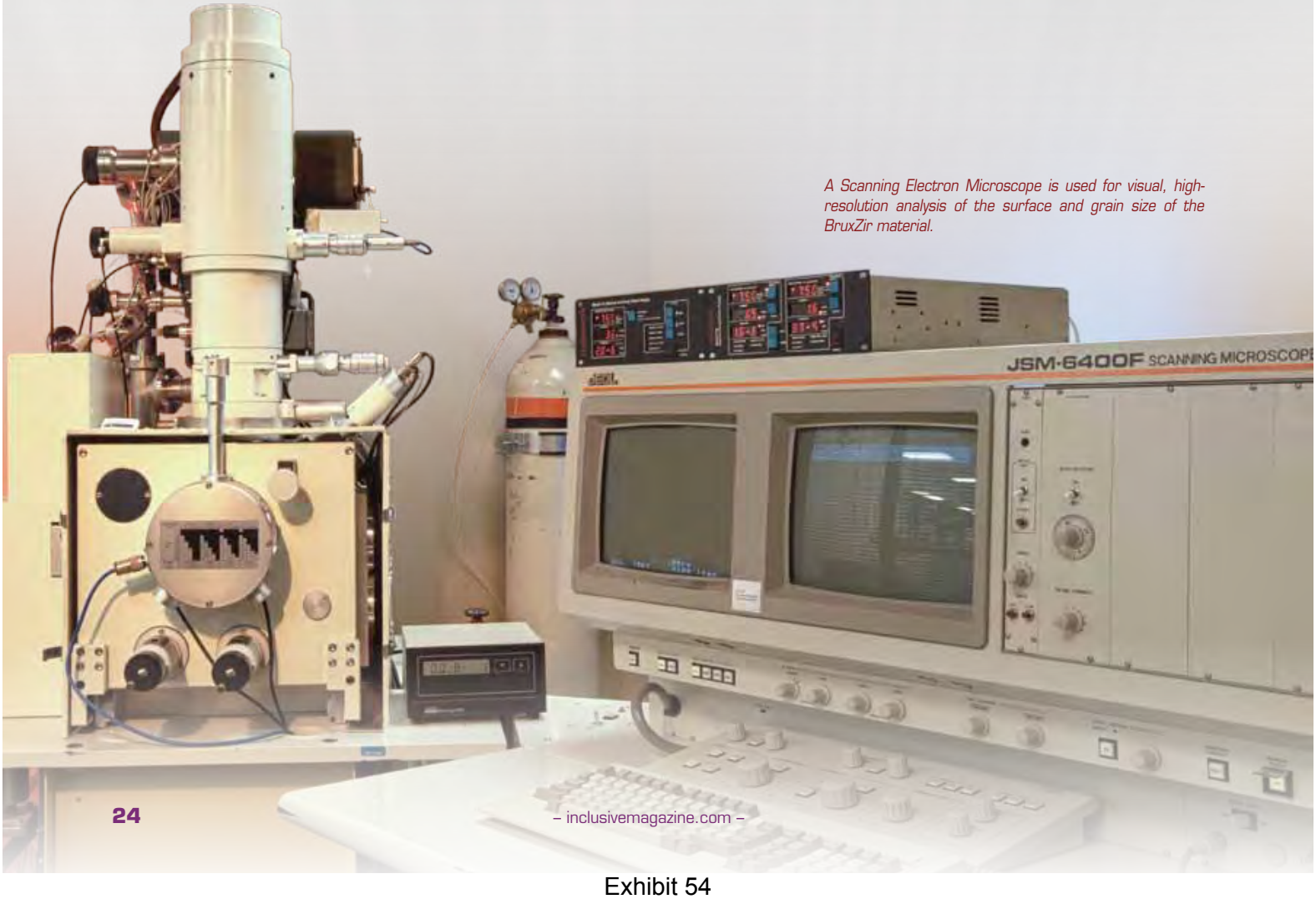
Transformation toughening was a breakthrough in achieving high-strength ceramic materials with a high value for fracture toughness. For the first time, a ceramic material was available with an internal mechanism for actually inhibiting crack propagation. A crack in a traditional ceramic travels all the way through the ceramic with little inhibition, resulting in immediate and brittle fracture and catastrophic failure. The partially stabilized zirconia

exhibits a fracture toughness that is three to six times higher than normal zirconia and most other ceramics. Partially stabilized zirconia is so tough that it can be struck with a hammer or even fabricated into a hammer for driving nails.

These innovations led to the development of BruxZir Solid Zirconia, which is indicated for bruxers and grinders as an esthetic posterior alternative to metal occlusal PFMs or cast-metal restorations. Designed and milled using CAD/CAM technology, BruxZir is sintered for 6.5 hours at 1,530 degrees Celsius. The final BruxZir crown or bridge emerges nearly chip-proof and is diamond polished and glazed to a smooth surface.

Another beneficial physical characteristic of BruxZir is its wear properties. The Glidewell R&D team has determined that diamond polishing the BruxZir crown provides long-term life for opposing enamel surfaces. This wear compatibility has been validated in enamel wear "in-vitro" studies, and clinical studies are currently under way as well.

To learn more about BruxZir® Solid Zirconia or to find a lab that offers it, visit bruxzir.com or call 800-854-7256.



A Scanning Electron Microscope is used for visual, high-resolution analysis of the surface and grain size of the BruxZir material.

Exhibit 55

R&D CORNER

Go online for in-depth content

Strength and Flexibility of BruxZir Solid Zirconia Implant Restorations

by Robin A. Carden, VP of Research & Development

A critical consideration with implant-borne restorations is the distribution of functional stresses. In the absence of a periodontal ligament to serve as a natural shock absorber, it is incumbent on the restoration to withstand the full force of those stresses. BruxZir® Solid Zirconia, a monolithic ceramic restoration with no porcelain overlay, has the ability to meet this demand with a blend of strength and flexibility, due to a set of intrinsic material properties that include high flexural strength, high fracture toughness, low coefficient of friction, and low coefficient of thermal expansion.

FLEXURAL STRENGTH

Typical zirconia materials demonstrate a flexural strength of more than 900 MPa. As a result of the proprietary methods used to process BruxZir milling blanks, BruxZir zirconia exhibits an even greater strength, measured as high as 1,510 MPa in accordance with the JIS R 1601 standard on an Instron-5564 electromechanical testing system *(Fig. 1)*. This standard, established by the Japan Fine Ceramics Association, specifies the testing method for three-point and four-point flexural strength of high-performance ceramics at room temperature. Compared to the flexural strength of conventional PFM restorations, measured at roughly 800 MPa or less, monolithic BruxZir zirconia boasts a strength advantage of nearly twice that of the traditional alternative, essentially allowing it to bend without breaking *(Fig. 2)*.

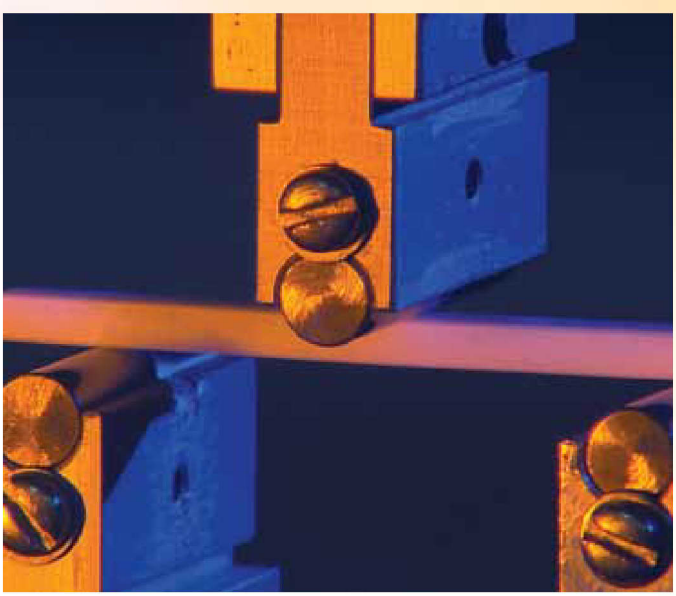


Figure 1: *Instron-5564, used to measure BruxZir zirconia's flexural strength*

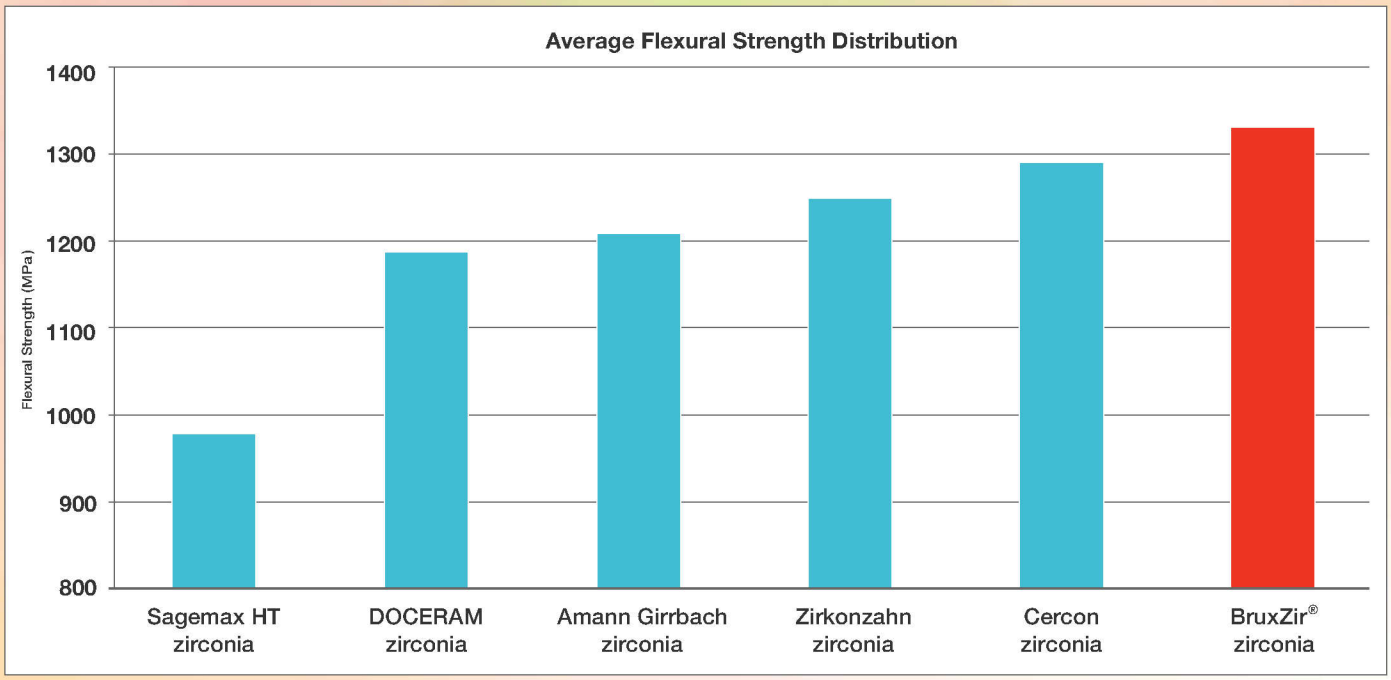


Figure 2: *Graph showing the average flexural strength distribution of monolithic zirconia products, as tested by Glidewell Laboratories*

FRACTURE TOUGHNESS

Fracture toughness (K_{1c} value) is a quantitative way of expressing a material's resistance to brittle fracture when a crack is present. Materials such as lead or steel, for example, demonstrate high fracture toughness, whereas most ceramic and glass-ceramic materials exhibit low and inconsistent fracture toughness. This means that a crack can travel through a typical ceramic with little resistance, resulting in immediate, brittle fracture and catastrophic failure. Partially stabilized zirconia, however, contains an internal mechanism that actually inhibits crack propagation. This "self-healing" event is known as phase transformation toughening. When faced with a propagating crack tip, a zirconia grain particle is able to absorb the associated energy by transforming from its tetragonal phase to the more stable monoclinic phase. This results in an associated volumetric expansion, effectively closing the advancing crack. Transformation toughening gives partially stabilized zirconia a K_{1c} value that is three to six times higher than normal cubic zirconia and most other ceramics, resulting in tremendous impact resistance.

Figure 3: *Spring fabricated from BruxZir zirconia*

Figure 4: *Compressed BruxZir zirconia spring*

Partially stabilized zirconia … contains an internal mechanism that actually inhibits crack propagation.

As a demonstration of this principle, note the fabrication of BruxZir zirconia into a spring-shaped coil *(Fig. 3)*. Due in part to its high K_{1c} value and ability to transform its structure, this coil can endure repeated compression cycles *(Fig. 4)*, returning each time to its original shape without suffering the fracture damage one might expect of a typically brittle ceramic.

COEFFICIENT OF FRICTION

Although dependent on system variables such as temperature, velocity and atmosphere, the coefficient of friction (COF) is often stated as a material property that describes the ratio of the force of friction between two bodies and the force pressing them together. Ice on steel, for example, would tend to have a low COF, while rubber on pavement tends to have a high COF. A material with a low COF value, such as that exhibited by BruxZir zirconia, can be perceived then as having a greater resistance to frictional wear present in any nanomechanical system, enabling it to better withstand the rigors of micromovement.

COEFFICIENT OF THERMAL EXPANSION

The coefficient of thermal expansion (CTE) describes how the size of an object changes with a change in temperature. In general, substances expand or contract when their temperature changes, with expansion or contraction occurring in all directions. This causes strain within the material, which again can introduce the potential for fracture. A lower CTE number indicates greater resistance to thermal shock. Because the oral environment is highly susceptible to rapid temperature changes, a material like BruxZir zirconia, characterized by a relatively low CTE, is better suited to withstand the rigors of that environment than a material with a higher CTE.

CONCLUSION

The fastest-growing product in the 42-year history of Glidewell Laboratories, BruxZir Solid Zirconia has quickly proven itself as a reliable, esthetic alternative to traditional PFM and full-cast restorations. Manufactured from yttria-stabilized zirconia powder specially processed to achieve a nanocrystalline particle size as small as 3 nm, BruxZir zirconia exhibits class-leading strength and flexibility in addition to its high biocompatibility. These mechanical properties enable it to absorb high levels of functional stress, making it an ideal material choice for implant-borne restorations, whether cement-retained or screw-retained *(Figs. 5, 6)*. IM

Figure 5: *Cement-retained BruxZir crown with Inclusive® All-Zirconia Custom Implant Abutment*

Figure 6: *Screw-retained BruxZir crown*

Exhibit 56

Full contour zirconia enraptures the industry.

A Changing Direction in Dentistry: Full-Contour Zirconia

By Robin A. Carden

Zirconia is one of the most studied ceramic materials in the world for uses ranging from telecommunications to the new energy of the future to environmentally-friendly products. In clinical dentistry, it is widely used for the fabrication of crown copings, bridge frameworks and custom implant abutments. Its durability, biocompatibility, natural esthetics and low cost when compared to alternative restorative materials make it the ideal solution for a variety of clinical applications. More recently, dental use is trending toward full-contour (monolithic) zirconia — that is, solid zirconia restorations with no porcelain overlay. Ongoing material advancements have produced the strongest and most reliable all-ceramic restoration to date, making zirconia an ideal alternative solution wherever traditional metal or PFM restorations might be prescribed.

Figure 1
(Above)
Zirconia Powder

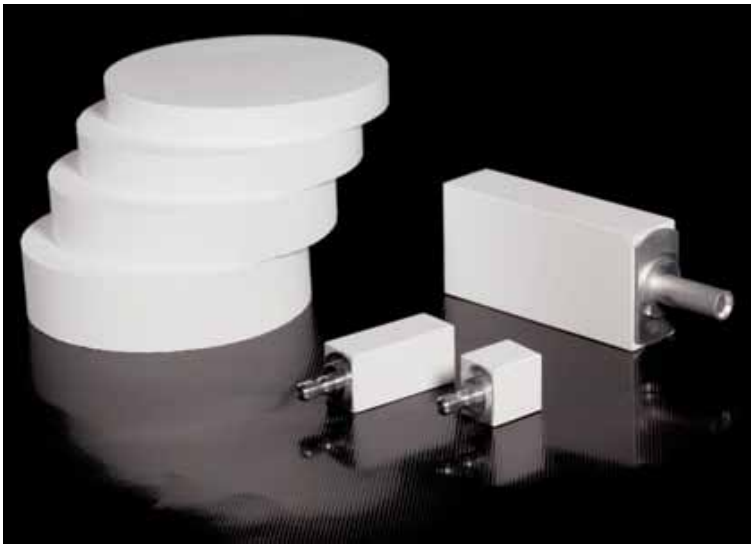


Figure 2
(Right)
BruxZir Blanks

Material Origins

Zirconia, or zirconium oxide, is the common name for the chemical compound zirconium dioxide (ZrO2). The material is commercially available in two basic forms. The first of these is naturally derived from the mineral Baddeleyite. The second is synthetically derived from zircon sand (ZrSiO4) using a solid state reaction process. Several oxides such as magnesium oxide (MgO), yttrium oxide (Y2O3), calcium oxide (CaO), cerium (III) oxide (CE2O3), and others are added to zirconia in order to stabilize the tetragonal and/or cubic phases. The resulting material, often referred to as ytrria-stabilized zirconia (YSZ), exhibits superior strength and flexibility, surpassing the mechanical limitations of traditional fine ceramics.

Material Advantages

The fast-growing popularity of full-contour zirconia is easy to understand when observing several material advantages:

1. **High Flexural Strength** — Full-contour zirconia products on the market today boast flexural strength ranging anywhere from 850MPa to 1,465MPa. These higher-level strength increases have been achieved through the use of post-powder processing. When compared to the flexural strength of porcelain ceramics, with typical ranges of 71MPa (feldspathic porcelain) to 419MPa (In-Ceram), the zirconia strength advantage becomes clear.
2. **High Fracture Toughness (K1C Value)** —Strength and toughness are not necessarily related. Brittle materials may exhibit significant tensile strength by supporting a

static load, whereas toughness indicates how much energy a material can absorb before mechanical failure. Also thought of as impact resistance, fracture toughness is a quantitative property that describes the ability of a material with inherent microstructural flaws to resist fracture via crack growth and propagation. A piece of lead or steel has high fracture toughness and will generally encounter ductile fracture, characterized by extensive plastic deformation prior to structural failure. Materials such as glass and traditional glass-ceramics typically exhibit low and inconsistent fracture toughness, and are prone to brittle fracture, characterized by a lack of apparent plastic deformation prior to structural failure. Thus, fracture toughness becomes one of the most important properties of any brittle material for virtually all design applications. The fracture toughness for partially stabilized zirconia is naturally high because of an internal mechanism that actually inhibits crack propagation. Inside, cubic grains are constraining the tetragonal precipitates that want to expand and release associated energy. When these grains are faced with a propagating crack tip, the tetragonal phase is released and allowed to change back to the more stable monoclinic phase. This results in an associated volumetric expansion, effectively closing the advancing crack. Known as phase transformation toughening, this unique self-healing event gives partially stabilized zirconia a fracture toughness that is three to six times higher than normal zirconia and most other ceramics. Even so, ongoing methods are being devised to modify the yield strength, ductility and fracture toughness of both crystalline and amorphous materials, including zirconia. For instance, consolidation processes are being used to reduce grain size. Because crack propagation through a material's grain boundaries is deflected by the material's grains, a material consisting of smaller grains becomes inherently stronger, as there are more grains to absorb energy from the force of the crack.

Figure 3 *(Left)*
Monicap BruxZir

Figure 4 *(Below)*
Monicap Full Cast

Whereas a crack in a traditional ceramic travels all the way through the material with little inhibition, transformation toughening represents a breakthrough in achieving all-ceramic materials with a high value for fracture toughness. Today's partially stabilized zirconia is so tough that it can be struck with a hammer or fabricated into a hammer for driving nails.

3. **Resistance to Thermal Shock —** Zirconia has relatively low thermal expansion numbers, giving it

Understanding Zirconia

Names: Zirconia, zirconium oxide, zirconium dioxide (ZrO_2), yttria-stabilized zirconia (YSZ)

Terms:

Phase Transformation Toughening: The naturally occurring process by which cubic grains within stabilized zirconia constrain tetragonal precipitates, effectively closing advancing cracks and resulting in a sort of self-healing of the material.

Fracture Toughness: A property that describes the ability of a material with inherent microstructural flaws to resist fracture via crack growth and propagation.

Plasticity: The deformation of a material undergoing non-reversible changes of shape in response to applied forces.

Brittle Fracture: No apparent plastic deformation takes place before fracture.

Ductile Fracture: Extensive plastic deformation takes place, characterized by slow propagation and absorption of large amounts of energy, before fracture.

excellent resistance to thermal shock. This means it will remain very stable in the mouth and will face fewer stress factors resulting from expansion and contraction.

4. **Improved Esthetics** — If there has been a complaint regarding full-contour zirconia to date, it would be that its opaque white hue lacks the translucent, ivory shade of natural teeth. Zirconia can be stained and glazed to a prescribed tooth shade, but has still been limited by a lack of inherent translucency. However, consolidation processes in the laboratory that initially focused on improving strength through reduced particle size have led to related innovations in material translucency. These advancements, along with improved blending processes, allow the purest zirconia powder to be changed into an ivory shade that is more lifelike than the typical snow-white zirconia. Whereas full-contour zirconia is typically prescribed only for posterior restorations, newer clinical cases have shown it to blend in reasonably well with anterior teeth. These continuing enhancements in color and translucency, to go along with the elimination of dark gingival lines associated with traditional PFM restorations, give rising hope to full-contour zirconia becoming an acceptable anterior restorative.

5. **Improved Wear Compatibility** — Diamond-polishing a full-contour zirconia crown provides longterm life for opposing enamel surfaces. This wear compatibility has been validated in enamel wear in-vitro studies, and clinical studies are also under way. A 2010 comparative wear study conducted by professor Dr. J. Geis-Gerstorfer and sponsored by Glidewell Dental Laboratories used the Willytech Chewing Simulator to simulate the clinical performance of both BruxZir Solid Zirconia and Ceramco®3 porcelain over a period of five years. The reported findings stated that, after 1.2 million wear cycles under a load of 5 kg, the wear of the antagonist situation (Steatite ball) was found to be significantly lower with BruxZir (72 ± 21µm) than with Ceramco3 (110 ± 48µm).

Figure 5 *(Above)*
Monicap Metal Occlusal

6. **Cost** — A discussion of the benefits offered by full-contour zirconia would not be complete without mentioning cost factors. Despite its many material advantages, zirconia is considerably less expensive than traditional, precious metal.

Indications

Full-contour zirconia is indicated for posterior crowns, crowns over implants and crowns with limited occlusal clearance. It is also indicated for full-arch bridges up to 14 units. Primary candidates include bruxers and grinders who do not desire cast gold or metal occlusal PFM restorations. For esthetic reasons, it is recommended that a facial veneer of porcelain be used on any zirconia-based anterior restoration. However, full-contour zirconia may be used in specific anterior cases where a dentist wishes to emphasize the strength of the restoration over its esthetics.

Availability

Commercially available zirconia blanks for in-lab milling include brands such as BruxZir, Sagemax HT, Crystal Diamond Zirconia, Zirlux, Prettau and Origin. Prescribed crowns include brands such as BruxZir, Suntech FC, Z-Brux, and TRICONia.

Due to its high flexural strength, high fracture toughness, resistance to thermal shock, metal-free esthetics and terrific wear compatibility, full-contour zirconia is an ideal material for dental restorations. It also boasts excellent contours and contacts for desired marginal fit, conventional chamfer prep and cementation, and affordability for both clinicians and their patients. Prescribed almost exclusively for posterior restorations, material advancements may make it an acceptable solution for some anterior restorations as well, further fueling its popularity as the material of choice for dental restorations today. **JDT**

About the Author:

Carden founded Talon Composites, the manufacturer of Talbor, a composite material that uses advanced ceramics and metals. To date, he holds more than 25 patents, mostly related to metal and ceramic composites. In 1998, he won the Design Engineering Award from Design News. He is also the inventor of the translucent orthodontic braces for 3M™ ESPE™ and Ceradyne Inc. Presently, he works at Glidewell Laboratories as senior director of research and development.

Exhibit 57

CERAMIC INDUSTRY The Exclusive Global Voice of Ceramic & Glass Business and Manufacturing

Virtually Bulletproof

By Robin Carden
December 1, 2010
Refined zirconia is being used to produce the strongest and most reliable all-ceramic dental material to date.

Partially stabilized zirconia's physical properties make it an ideal material for dental restorations.

Zirconia is a popular dental material for the creation of dental restorations such as copings for crowns, frameworks for bridges, and custom implant abutments for implant cases. Recently, this advanced material has been refined to produce the strongest and most reliable all-ceramic to date: BruxZir(r) Solid Zirconia, a full-contour zirconia restoration with no porcelain overlay.*

A failing amalgam restoration.

Properties

Also known as zirconium oxide or zirconia, zirconium dioxide (ZrO_2) is commercially available in two basic forms: naturally, as the mineral baddeleyite; and synthetically, as derived from zircon sand ($ZrSiO_4$). Zirconia powder is synthesized from zircon sand (ZrO_2*SiO_2) using a solid-state reaction process. Several oxides are added to zirconia to stabilize the tetragonal and/or cubic phases: magnesium oxide (MgO), yttrium oxide (Y_2O_3), calcium oxide (CaO) and cerium (III) oxide (Ce_2O_3), and others.

BruxZir is manufactured from yttria-stabilized zirconia (YSZ) powder, which exhibits superior mechanical properties such as high strength and flexibility. YSZ surpasses the strength limitations of traditional fine ceramics and has the potential for use in a variety of applications, including telecommunications, renewable

energy, and dental restorations.

Partially stabilized zirconia's physical properties make it an ideal material for dental restorations. Typical zirconia materials exhibit flexural strength of more than 1200 MPa. However, because of post-powder processing, BruxZir Solid Zirconia dental restorations are able to exceed that threshold with flexural strengths of up to 1465 MPa.

The fracture toughness for partially stabilized zirconia is high because of the phase transformation toughening that occurs in the material. The toughening mechanism comes into play when a crack is encountered. The cubic grains constrain the tetragonal precipitates that want to expand and release associated energy. When these grains are faced with a propagating crack tip, the tetragonal phase is released and allowed to change back to the more stable monoclinic phase. This results in the associated volumetric expansion, effectively closing the advancing crack through a kind of self-healing event. This also means that the material features high impact resistance.

Zirconia exhibits excellent resistance to thermal shock. With its relatively low thermal expansion numbers, the material remains very stable in the mouth.

Finally, zirconia has a natural opaque white hue. Glidewell Laboratories has recorded advancements that allow zirconia to be changed into a more desirable translucent natural ivory shade, which is more lifelike than typical snow-white zirconia.

A failing amalgam restoration (from above) is replaced with a BruxZir Solid Zirconia crown.

Refining Process

The lab's scientists start with high-purity powders and create better chemistry by refining particulates via size reduction and blending. The laboratory then creates a green pre-form with very high pre-bisque firing density by using unique consolidation processes that enable the smallest particulates to be as close as possible before the machining starts. In doing so, the lab also reduces the elongation factor, which means a more accurate crown dimension. After machining, the part is sintered to full density.

The resulting material features a small grain size, which improves flexural strength and fracture toughness. As a crack moves through a material's grain boundaries, it is deflected by the material's grains. If a material has many grains to deflect and take energy out of the force of the crack, it becomes inherently stronger. A focus on smaller particulates has also created improved translucency.

Material Toughness

Brittle materials may exhibit significant tensile strength by supporting a static load, but toughness indicates how much energy a material can absorb before mechanical failure. Fracture toughness is a property that

describes the ability of a material with inherent microstructural flaws to resist fracture via crack growth and propagation.

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Another beneficial physical characteristic of BruxZir is its wear properties-diamond polishing the BruxZir crown provides long-term life for opposing enamel surfaces. This wear compatibility has been validated in enamel wear "in-vitro" studies, and clinical studies are currently under way as well.

For more information, call (800) 854-7256 or visit www.bruxzir.com.

*Developed by Glidewell Laboratories

Links

- BruxZir

Robin A. Carden is a senior director of research and development at Glidewell Laboratories in Newport Beach, Calif.

Exhibit 58

Robin Bartolo

From: Robin Bartolo
Sent: Tuesday, August 16, 2011 5:10 PM
To: 'shaun@keatingdentalarts.com'
Subject: Bruxzir Samples

Hello Shaun,

Just a quick follow up to learn if you had a chance to evaluate the Bruxzir blanks and liquids we sent to you last week?

It would be great to get your feedback as I hope you saw enough of a difference to consider adding this product to your laboratory services.

Best regards,

Robin

Robin Bartolo, CDT
Sales Manager, Glidewell Direct

GLIDEWELL LABORATORIES

Authentic BruxZir Solid Zirconia

Glidewell Laboratories
18551 Von Karman
Irvine, CA 92612
(888) 303-3975 • (949) 399-8383
www.glidewelldental.com

Exhibit 58
-638-

Exhibit 59

United States of America
United States Patent and Trademark Office

BRUXZIR

Reg. No. 3,739,663
Registered Jan. 19, 2010

Int. Cl.: 10

TRADEMARK
PRINCIPAL REGISTER

JAMES R. GLIDEWELL, DENTAL CERAMIC, INC. (CALIFORNIA CORPORATION), DBA GLIDEWELL LABORATORIES
PROFESSIONAL SERVICES
4141 MACARTHUR BLVD.
NEWPORT BEACH, CA 92660

FOR: DENTAL BRIDGES; DENTAL CAPS; DENTAL CROWNS; DENTAL INLAYS; DENTAL ONLAYS; DENTAL PROSTHESES , IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

FIRST USE 6-6-2009; IN COMMERCE 6-6-2009.

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SER. NO. 77-761,757, FILED 6-17-2009.

KEVIN CORWIN, EXAMINING ATTORNEY

David J. Kappos

Director of the United States Patent and Trademark Office

Exhibit 60

AO 120 (Rev. 3/04)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

~~SACV11-01309-DOC(ANx)~~

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of California on the following ☐ Patents or ☒ Trademarks:

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
SACV11-01309 DOC (ANx)	8-30-2011	Central District of California

PLAINTIFF	DEFENDANT
JAMES R. GLIDEWELL DENTAL CERAMICS, INC. DBA GLIDEWELL LABORATORIES, a California corporation	KEATING DENTAL ARTS, INC., a California corporation

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	3,739,663	01-19-2010	James R. Glidewell Dental Ceramics, Inc. dba Glidewell Laboratories
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 3/04)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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JAMES R. GLIDEWELL DENTAL CERAMICS, INC. DBA GLIDEWELL LABORATORIES, a California corporation	KEATING DENTAL ARTS, INC., a California corporation

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	3,739,663	01-19-2010	James R. Glidewell Dental Ceramics, Inc. dba Glidewell Laboratories
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

United States of America
United States Patent and Trademark Office

BRUXZIR

Reg. No. 3,739,663
Registered Jan. 19, 2010

Int. Cl.: 10

TRADEMARK
PRINCIPAL REGISTER

JAMES R. GLIDEWELL, DENTAL CERAMIC, INC. (CALIFORNIA CORPORATION), DBA GLIDEWELL LABORATORIES
PROFESSIONAL SERVICES
4141 MACARTHUR BLVD.
NEWPORT BEACH, CA 92660

FOR: DENTAL BRIDGES; DENTAL CAPS; DENTAL CROWNS; DENTAL INLAYS; DENTAL ONLAYS; DENTAL PROSTHESES , IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

FIRST USE 6-6-2009; IN COMMERCE 6-6-2009.

THE MARK CONSISTS OF STANDARD CHARACTERS WITHOUT CLAIM TO ANY PARTICULAR FONT, STYLE, SIZE, OR COLOR.

SER. NO. 77-761,757, FILED 6-17-2009.

KEVIN CORWIN, EXAMINING ATTORNEY

David J. Kappos

Director of the United States Patent and Trademark Office

From: TMOfficialNotices@USPTO.GOV
Sent: Tuesday, November 3, 2009 01:24 AM
To: kallred@glidewelldental.com
Subject: Official USPTO Notice of Publication: Serial Number 77761757

NOTICE OF PUBLICATION

Serial Number: 77-761,757
Mark: BRUXZIR(STANDARD CHARACTER MARK)
International Class(es): 010
Applicant: James R. Glidewell, Dental Ceramic, Inc.
Attorney Reference Number:

The mark identified above has been published in the *Trademark Official Gazette* (OG) on Nov 03, 2009. Any party who believes it will be damaged by the registration of the mark may file a notice of opposition (or extension of time therefor) with the Trademark Trial and Appeal Board. If no party files an opposition or extension request within thirty (30) days after the publication date, then within twelve (12) weeks of the publication date a certificate of registration should issue.

On the publication date or shortly thereafter, the applicant should carefully review the information that appears in the OG for accuracy (see steps, *below*). If any information is incorrect, the applicant should immediately email the requested correction to **TMPostPubQuery@uspto.gov**. For general information about this notice, please contact the Trademark Assistance Center at 1-800-786-9199.

1. Click on the following link or paste the URL into an internet browser:
http://www.uspto.gov/web/trademarks/tmog/20091103_OG.pdf#page=1
2. Wait for the total OG to download completely (as indicated on bottom of OG page).
3. At the top/side of the displayed page, click wherever the "binoculars" icon appears.
4. Enter in the "search" box the name of the applicant (for individual: last name, first name) or the serial number in this exact format (with hyphen and comma): 77-761,757, e.g.
5. View the retrieved result(s). If multiple results appear in the "results" box, click directly on each "search term" shown in the box to access all separate appearances in the OG.

Trademark Snap Shot Publication & Issue Review Stylesheet

(Table presents the data on Publication & Issue Review Complete)

OVERVIEW

SERIAL NUMBER	77761757	FILING DATE	06/17/2009
REG NUMBER	0000000	REG DATE	N/A
REGISTER	PRINCIPAL	MARK TYPE	TRADEMARK
INTL REG #	N/A	INTL REG DATE	N/A
TM ATTORNEY	CORWIN, KEVIN SCOTT	L.O. ASSIGNED	112

PUB INFORMATION

RUN DATE	09/30/2009
PUB DATE	11/03/2009
STATUS	681-PUBLICATION/ISSUE REVIEW COMPLETE
STATUS DATE	09/29/2009
LITERAL MARK ELEMENT	BRUXZIR

DATE ABANDONED	N/A	DATE CANCELLED	N/A
SECTION 2F	NO	SECTION 2F IN PART	NO
SECTION 8	NO	SECTION 8 IN PART	NO
SECTION 15	NO	REPUB 12C	N/A
RENEWAL FILED	NO	RENEWAL DATE	N/A
DATE AMEND REG	N/A		

FILING BASIS

FILED BASIS		CURRENT BASIS		AMENDED BASIS	
1 (a)	YES	1 (a)	YES	1 (a)	NO
1 (b)	NO	1 (b)	NO	1 (b)	NO
44D	NO	44D	NO	44D	NO
44E	NO	44E	NO	44E	NO
66A	NO	66A	NO		
NO BASIS	NO	NO BASIS	NO		

MARK DATA

STANDARD CHARACTER MARK	YES
LITERAL MARK ELEMENT	BRUXZIR

MARK DRAWING CODE	4-STANDARD CHARACTER MARK
COLOR DRAWING FLAG	NO

CURRENT OWNER INFORMATION

PARTY TYPE	10-ORIGINAL APPLICANT
NAME	James R. Glidewell, Dental Ceramic, Inc.
ADDRESS	Professional Services 4141 MacArthur Blvd. Newport Beach, CA 92660
ENTITY	03-CORPORATION
CITIZENSHIP	California
DBA/AKA	DBA Glidewell Laboratories

GOODS AND SERVICES

INTERNATIONAL CLASS	010
DESCRIPTION TEXT	Dental bridges; Dental caps; Dental crowns; Dental inlays; Dental onlays; Dental prostheses

GOODS AND SERVICES CLASSIFICATION

INTERNATIONAL CLASS	010	FIRST USE DATE	06/06/2009	FIRST USE IN COMMERCE DATE	06/06/2009	CLASS STATUS	6-ACTIVE

MISCELLANEOUS INFORMATION/STATEMENTS

CHANGE IN REGISTRATION	NO

PROSECUTION HISTORY

DATE	ENT CD	ENT TYPE	DESCRIPTION	ENT NUM
09/29/2009	PREV	O	LAW OFFICE PUBLICATION REVIEW COMPLETED	006
09/29/2009	ALIE	A	ASSIGNED TO LIE	005
09/17/2009	CNSA	O	APPROVED FOR PUB - PRINCIPAL REGISTER	004
09/16/2009	DOCK	D	ASSIGNED TO EXAMINER	003
06/22/2009	NWOS	I	NEW APPLICATION OFFICE SUPPLIED DATA ENTERED IN TRAM	002
06/20/2009	NWAP	I	NEW APPLICATION ENTERED IN TRAM	001

CURRENT CORRESPONDENCE INFORMATION

ATTORNEY	Keith D. Allred, Esq.
CORRESPONDENCE ADDRESS	KEITH D. ALLRED, ESQ. KEITH D. ALLRED, GENERAL COUNSEL 4141 MACARTHUR BLVD NEWPORT BEACH, CA 92660-2015
DOMESTIC REPRESENTATIVE	NONE

BRUXZIR

Trademark Snap Shot Publication Stylesheet

(Table presents the data on Publication Approval)

OVERVIEW

SERIAL NUMBER	77761757	FILING DATE	06/17/2009
REG NUMBER	0000000	REG DATE	N/A
REGISTER	PRINCIPAL	MARK TYPE	TRADEMARK
INTL REG #	N/A	INTL REG DATE	N/A
TM ATTORNEY	CORWIN, KEVIN SCOTT	L.O. ASSIGNED	112

PUB INFORMATION

RUN DATE	09/18/2009
PUB DATE	N/A
STATUS	680-APPROVED FOR PUBLICATON
STATUS DATE	09/17/2009
LITERAL MARK ELEMENT	BRUXZIR

DATE ABANDONED	N/A	DATE CANCELLED	N/A
SECTION 2F	NO	SECTION 2F IN PART	NO
SECTION 8	NO	SECTION 8 IN PART	NO
SECTION 15	NO	REPUB 12C	N/A
RENEWAL FILED	NO	RENEWAL DATE	N/A
DATE AMEND REG	N/A		

FILING BASIS

FILED BASIS		CURRENT BASIS		AMENDED BASIS	
1 (a)	YES	1 (a)	YES	1 (a)	NO
1 (b)	NO	1 (b)	NO	1 (b)	NO
44D	NO	44D	NO	44D	NO
44E	NO	44E	NO	44E	NO
66A	NO	66A	NO		
NO BASIS	NO	NO BASIS	NO		

MARK DATA

STANDARD CHARACTER MARK	YES
LITERAL MARK ELEMENT	BRUXZIR

MARK DRAWING CODE	4-STANDARD CHARACTER MARK
COLOR DRAWING FLAG	NO

CURRENT OWNER INFORMATION

PARTY TYPE	10-ORIGINAL APPLICANT
NAME	James R. Glidewell, Dental Ceramic, Inc.
ADDRESS	Professional Services 4141 MacArthur Blvd. Newport Beach, CA 92660
ENTITY	03-CORPORATION
CITIZENSHIP	California
DBA/AKA	DBA Glidewell Laboratories

GOODS AND SERVICES

INTERNATIONAL CLASS	010
DESCRIPTION TEXT	Dental bridges; Dental caps; Dental crowns; Dental inlays; Dental onlays; Dental prostheses

GOODS AND SERVICES CLASSIFICATION

INTERNATIONAL CLASS	010	FIRST USE DATE	06/06/2009	FIRST USE IN COMMERCE DATE	06/06/2009	CLASS STATUS	6-ACTIVE

MISCELLANEOUS INFORMATION/STATEMENTS

CHANGE IN REGISTRATION	NO

PROSECUTION HISTORY

DATE	ENT CD	ENT TYPE	DESCRIPTION	ENT NUM
09/17/2009	CNSA	O	APPROVED FOR PUB - PRINCIPAL REGISTER	004
09/16/2009	DOCK	D	ASSIGNED TO EXAMINER	003
06/22/2009	NWOS	I	NEW APPLICATION OFFICE SUPPLIED DATA ENTERED IN TRAM	002
06/20/2009	NWAP	I	NEW APPLICATION ENTERED IN TRAM	001

CURRENT CORRESPONDENCE INFORMATION

ATTORNEY	Keith D. Allred, Esq.
CORRESPONDENCE ADDRESS	KEITH D. ALLRED, ESQ. KEITH D. ALLRED, GENERAL COUNSEL

	4141 MACARTHUR BLVD NEWPORT BEACH, CA 92660-2015
DOMESTIC REPRESENTATIVE	NONE

BRUXZIR

*** User:kcorwin ***

#	Total Marks	Dead Marks	Live Viewed Docs	Live Viewed Images	Status/ Search Duration	Search
01	22	7	15	13	0:02	("james" and "glidewell")[on] or ("dental" and "ceramic")[on]
02	1	0	1	1	0:01	*bru{"xckq"}$1{"zsc"}{"iye"}r*[bi,ti]
03	5	3	2	2	0:01	*br{v1:2}{"xckq"}$1{"zsc"}{"iye"}r*[bi,ti]
04	7308	N/A	0	0	0:03	*br{v1:2}{"xckq"}*[bi,ti] not dead[ld]
05	46192	N/A	0	0	0:05	*{"zsc"}{"iye"}r*[bi,ti] not dead[ld]
06	192	0	192	154	0:01	4 and 5
07	1729	N/A	0	0	0:03	4 and "010"[cc]
08	2263	N/A	0	0	0:01	4 and ("010" a b 200)[cc]
09	188	0	188	133	0:02	4 and ("010" a b 200)[ic]
10	178	0	178	126	0:01	9 not 6
11	13	0	13	9	0:03	*brux*[bi,ti] not dead[ld]

Session started 9/17/2009 1:04:56 PM

Session finished 9/17/2009 1:14:05 PM

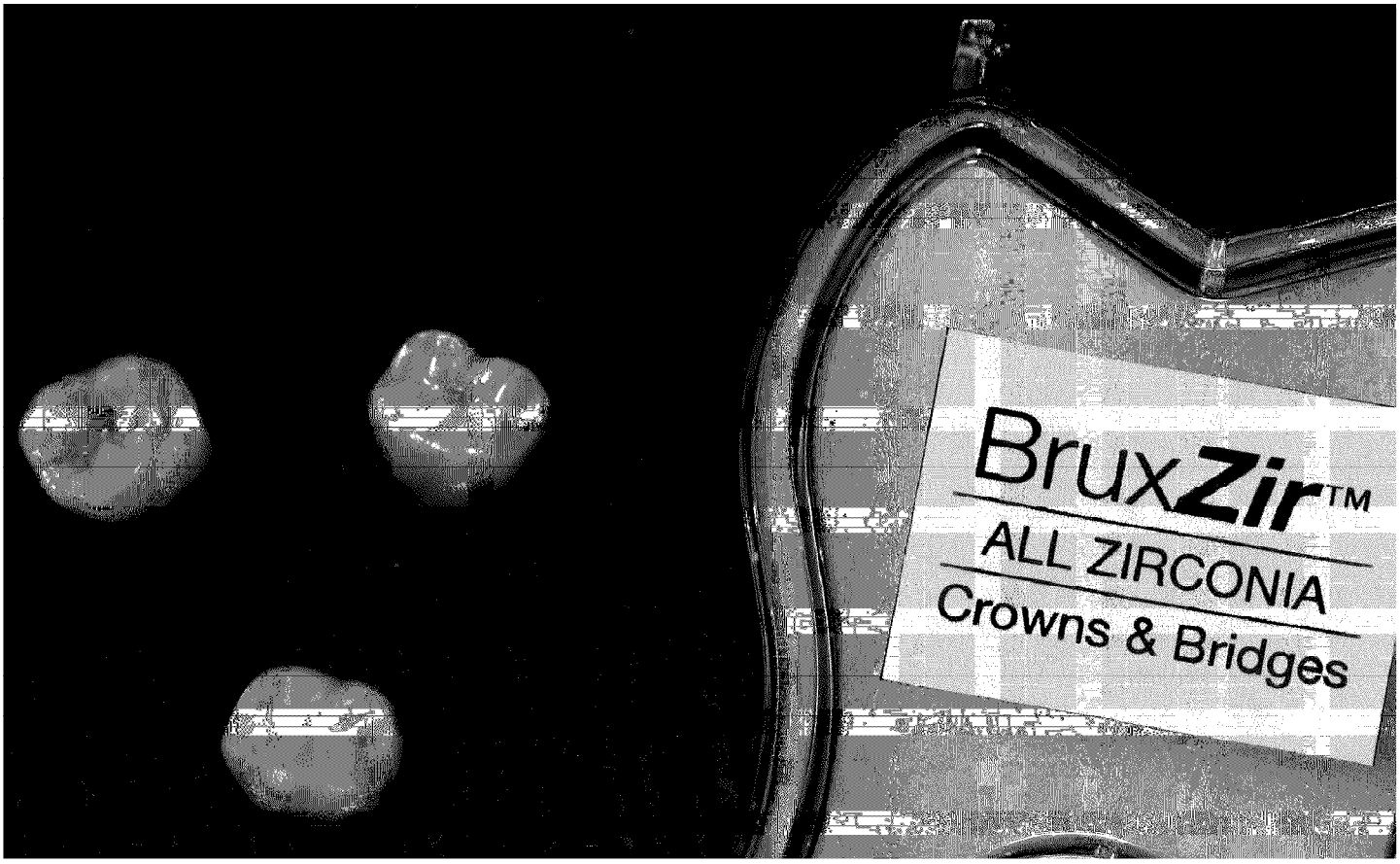
Total search duration 0 minutes 23 seconds

Session duration 9 minutes 9 seconds

Defaut NEAR limit=1ADJ limit=1

Sent to TICRS as Serial Number: 77761757

BRUXZIR


BruxZir™
ALL ZIRCONIA
Crowns & Bridges

PTO Form 1478 (Rev 9/2006)
OMB No. 0651 0009 (Exp 12/31/2011)

Trademark/Service Mark Application, Principal Register

TEAS Plus Application

Serial Number: 77761757
Filing Date: 06/17/2009

NOTE: Data fields with the * are mandatory under TEAS Plus. The wording "(if applicable)" appears where the field is only mandatory under the facts of the particular application.

The table below presents the data as entered.

Input Field	Entered
TEAS Plus	**YES**
MARK INFORMATION	
***MARK**	BRUXZIR
***STANDARD CHARACTERS**	YES
USPTO-GENERATED IMAGE	YES
LITERAL ELEMENT	BRUXZIR
***MARK STATEMENT**	The mark consists of standard characters, without claim to any particular font, style, size, or color.
REGISTER	Principal
APPLICANT INFORMATION	
***OWNER OF MARK**	James R. Glidewell, Dental Ceramic, Inc.
DBA/AKA/TA/FORMERLY	DBA Glidewell Laboratories
INTERNAL ADDRESS	Professional Services
***STREET**	4141 MacArthur Blvd.
***CITY**	Newport Beach
***STATE (Required for U.S. applicants)**	California
***COUNTRY**	United States
***ZIP/POSTAL CODE (Required for U.S. applicants only)**	92660

PHONE	949-440-2683
FAX	949-440-2787
EMAIL ADDRESS	kallred@glidewelldental.com
LEGAL ENTITY INFORMATION	
***TYPE**	CORPORATION
***STATE/COUNTRY OF INCORPORATION**	California
GOODS AND/OR SERVICES AND BASIS INFORMATION	
***INTERNATIONAL CLASS**	010
IDENTIFICATION	Dental bridges; Dental caps; Dental crowns; Dental inlays; Dental onlays; Dental prostheses
***FILING BASIS**	SECTION 1(a)
FIRST USE ANYWHERE DATE	At least as early as 06/06/2009
FIRST USE IN COMMERCE DATE	At least as early as 06/06/2009
SPECIMEN FILE NAME(S)	\\TICRS\EXPORT7\IMAGEOUT7 \777\617\77761757\xml1\FT K0003.JPG
SPECIMEN DESCRIPTION	Dental devices in the nature of full contour zirconia crowns, a label, and a plastic box that is used to deliver said devices, with said label affixed to the lid of said box.
ADDITIONAL STATEMENTS INFORMATION	
*TRANSLATION (if applicable)	
*TRANSLITERATION (if applicable)	
*CLAIMED PRIOR REGISTRATION (if applicable)	
*CONSENT (NAME/LIKENESS) (if applicable)	
*CONCURRENT USE CLAIM (if applicable)	
ATTORNEY INFORMATION	
NAME	Keith D. Allred, Esq.
FIRM NAME	Keith D. Allred, General Counsel
INTERNAL ADDRESS	Professional Services

STREET	4141 MacArthur Blvd.
CITY	Newport Beach
STATE	California
COUNTRY	United States
ZIP/POSTAL CODE	92660
PHONE	949-440-2683
FAX	949-440-2787
EMAIL ADDRESS	kallred@glidewelldental.com
AUTHORIZED TO COMMUNICATE VIA EMAIL	Yes
CORRESPONDENCE INFORMATION	
***NAME**	Keith D. Allred, Esq.
FIRM NAME	Keith D. Allred, General Counsel
INTERNAL ADDRESS	Professional Services
***STREET**	4141 MacArthur Blvd.
***CITY**	Newport Beach
***STATE (Required for U.S. applicants)**	California
***COUNTRY**	United States
***ZIP/POSTAL CODE**	92660
PHONE	949-440-2683
FAX	949-440-2787
***EMAIL ADDRESS**	kallred@glidewelldental.com
***AUTHORIZED TO COMMUNICATE VIA EMAIL**	Yes
FEE INFORMATION	
NUMBER OF CLASSES	1
FEE PER CLASS	275
***TOTAL FEE PAID**	275
SIGNATURE INFORMATION	
*** SIGNATURE**	/K. D. Allred/
*** SIGNATORY'S NAME**	Keith D. Allred
*** SIGNATORY'S POSITION**	General Counsel

* **DATE SIGNED**	06/17/2009

PTO Form 1478 (Rev 9/2006)
OMB No. 0651-0009 (Exp 12/31/2011)

Trademark/Service Mark Application, Principal Register

TEAS Plus Application

Serial Number: 77761757
Filing Date: 06/17/2009

To the Commissioner for Trademarks:

MARK: BRUXZIR (Standard Characters, see mark)
The literal element of the mark consists of BRUXZIR.
The mark consists of standard characters, without claim to any particular font, style, size, or color.

The applicant, James R. Glidewell, Dental Ceramic, Inc., DBA Glidewell Laboratories, a corporation of California, having an address of
Professional Services,
4141 MacArthur Blvd.
Newport Beach, California 92660
United States
requests registration of the trademark/service mark identified above in the United States Patent and Trademark Office on the Principal Register established by the Act of July 5, 1946 (15 U.S.C. Section 1051 et seq.), as amended, for the following:

For specific filing basis information for each item, you must view the display within the Input Table.
International Class 010: Dental bridges; Dental caps; Dental crowns; Dental inlays; Dental onlays; Dental prostheses

Use in Commerce: The applicant is using the mark in commerce, or the applicant's related company or licensee is using the mark in commerce, or the applicant's predecessor in interest used the mark in commerce, on or in connection with the identified goods and/or services. 15 U.S.C. Section 1051(a), as amended.

In International Class 010, the mark was first used at least as early as 06/06/2009, and first used in commerce at least as early as 06/06/2009, and is now in use in such commerce. The applicant is submitting one specimen(s) showing the mark as used in commerce on or in connection with any item in the class of listed goods and/or services, consisting of a(n) Dental devices in the nature of full contour zirconia crowns, a label, and a plastic box that is used to deliver said devices, with said label affixed to the lid of said box..
Specimen File1

The applicant's current Attorney Information:
Keith D. Allred, Esq. of Keith D. Allred, General Counsel
Professional Services

4141 MacArthur Blvd.
Newport Beach, California 92660
United States

The applicant's current Correspondence Information:

Keith D. Allred, Esq.
Keith D. Allred, General Counsel
Professional Services
4141 MacArthur Blvd.
Newport Beach, California 92660
949-440-2683(phone)
949-440-2787(fax)
kallred@glidewelldental.com (authorized)

A fee payment in the amount of $275 has been submitted with the application, representing payment for 1 class(es).

Declaration

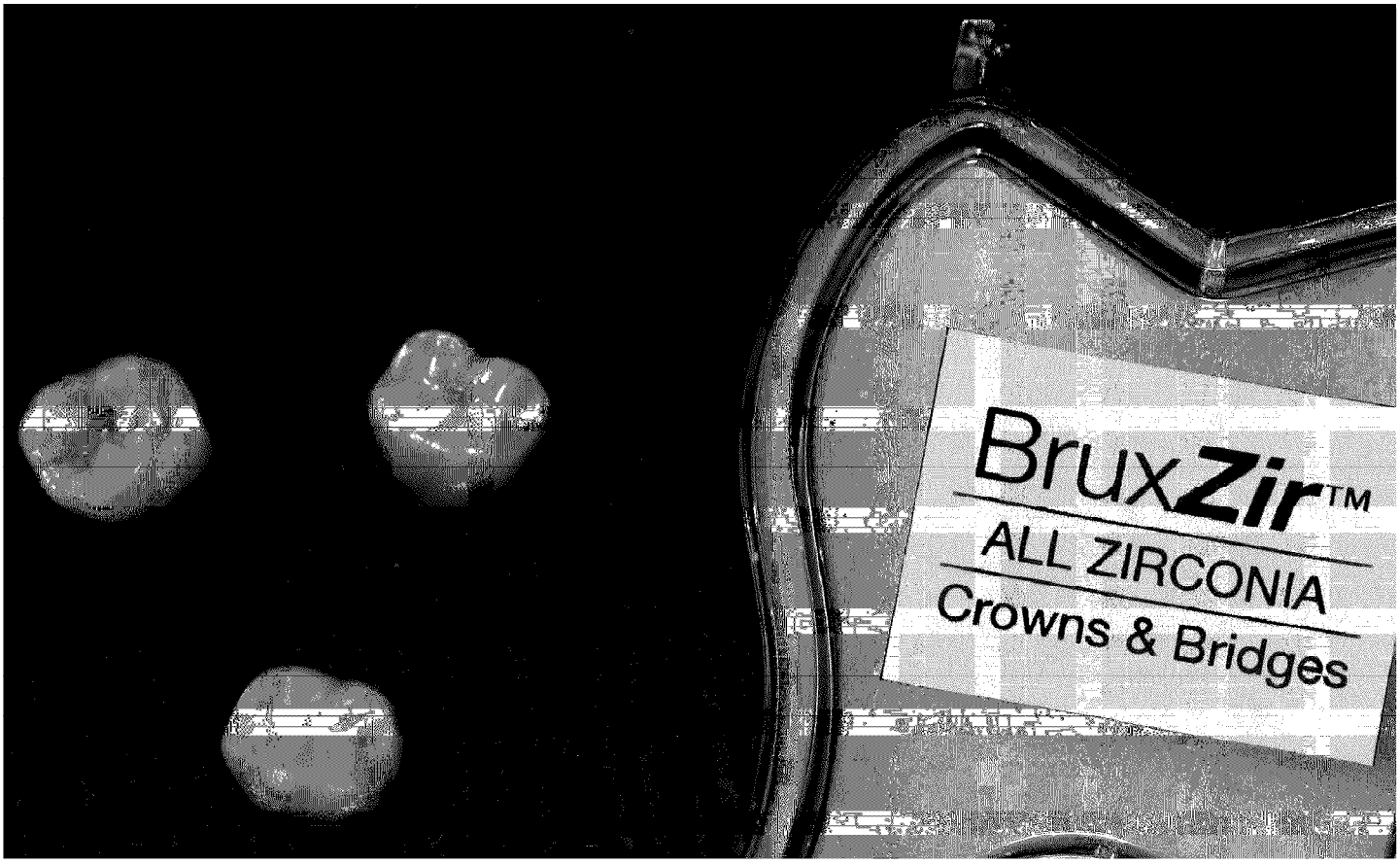
The undersigned, being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. Section 1001, and that such willful false statements, and the like, may jeopardize the validity of the application or any resulting registration, declares that he/she is properly authorized to execute this application on behalf of the applicant; he/she believes the applicant to be the owner of the trademark/service mark sought to be registered, or, if the application is being filed under 15 U.S.C. Section 1051(b), he/she believes applicant to be entitled to use such mark in commerce; to the best of his/her knowledge and belief no other person, firm, corporation, or association has the right to use the mark in commerce, either in the identical form thereof or in such near resemblance thereto as to be likely, when used on or in connection with the goods/services of such other person, to cause confusion, or to cause mistake, or to deceive; and that all statements made of his/her own knowledge are true; and that all statements made on information and belief are believed to be true.

Signature: /K. D. Allred/ Date Signed: 06/17/2009
Signatory's Name: Keith D. Allred
Signatory's Position: General Counsel

RAM Sale Number: 8133
RAM Accounting Date: 06/17/2009

Serial Number: 77761757
Internet Transmission Date: Wed Jun 17 12:49:05 EDT 2009
TEAS Stamp: USPTO/FTK-76.230.103.132-200906171249051
51810-77761757-400864543d31a13a3476be917
6734297eea-CC-8133-20090617120139466448

BRUXZIR


BruxZir™
ALL ZIRCONIA
Crowns & Bridges